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(54) **Device for cleaning from a conveyor belt fluid substances sprayed thereon**

(57) The device for cleaning from a conveyor belt (T), driven on rollers, fluid substances sprayed thereon, in particular for machines for spraying paint or other products, comprises a steel cylinder or roller with a smooth surface (1), which operates on the return section of the conveyor (T) with a parallel arrangement for example facing the end drive roller (R) of the said conveyor and which rotates in a direction opposite to the direction of feeding of the return section of the said conveyor, so as to perform

effective shaving-off of the residual paint which is detached by scraping means from this reverse roller and collected inside a recovery tank. These scraping means act on the generatrix of a bottom zone of the said reverse roller (1) and consisting of a corresponding longitudinal portion of the upper section of a cleaning conveyor belt (2) made of suitable composite flexible material, for example similar to that used for the said main conveyor (T), and situated with its longitudinal axis in the direction of the length of the reverse roller (1).

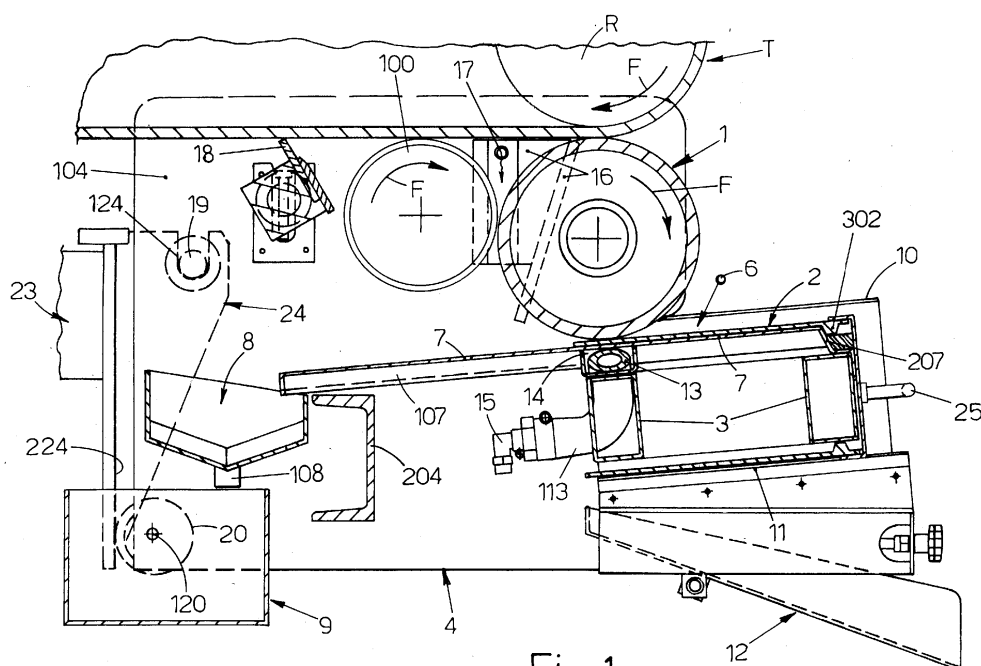


Fig.1

Description

[0001] The invention concerns a device for cleaning a fluid substance from a conveyor belt which is endlessly wound and driven around at least two end rollers, at least one of which is motor-driven. In particular the invention relates to the conveyor belts of machines and plants for painting, dyeing or impregnating processes, referred to below in short and for the sake of simplicity as "painting machines", which convey the articles to be treated through a chamber for spraying the fluid treatment substance, such as paint for example. The conveyor belt is formed by two sections: an upper outward section, on which the articles to be treated are usually rested, said articles, when they pass through the spraying chamber, being coated with the paint spray, and a lower return section, which is situated outside the said spraying chamber and which is soiled with paint and must be cleaned before returning to the upper level, in order to recover the residual paint and ensure that the clean conveyor is able to receive new articles.

[0002] The devices currently used to recover the residual paint and clean the belt comprise means for removing said residual paint collected by the belt during coating of the parts, by means of a shaving or scraping operation, and comprise cleaning systems which in synchronism wet the belt with solvent and then dry it, for example using fixed doctor blades or rotating cylinders or a combination of these means.

[0003] In European patent EP 425969 in the name of the Applicant, the cleaning device comprises a steel cylinder or roller with a smooth surface, which acts on the return section of the conveyor with a parallel arrangement for example facing the end drive roller of the said conveyor and this steel roller is made to rotate in the opposite direction to the direction of feeding of the belt, so as to perform effective shaving-off of the residual paint which is then detached from this roller by scraping means and collected in a recovery hopper. The said counter-rotating cleaning roller, also called a reverse roller, is partially immersed with a bottom portion thereof inside a solvent-containing tank so as to be cleaned and convey a film of the said solvent into the zone of contact with the lower section of the belt to be cleaned, in order to wet the belt zone from which the paint is removed and ensure that the said conveyor section leaves the reverse roller with a small amount of solvent which has the function of softening further any residual paint which can thus be more easily removed by following cleaning means comprising a further reverse roller and/or fixed doctor blades and/or rotating brushes and any other suitable means.

[0004] This reverse-roller cleaning system has, over time, proved to be very valid and advantageous, but poses problems associated with the accumulation of paint on the doctor blade for initial scraping of the said reverse roller, especially when the paint is very dense, so much so that in these cases the said doctor blade is immersed during operation inside the solvent tank which thus be-

comes contaminated with paint, so that the solvent must be continually removed and renewed.

[0005] Another device for cleaning the conveyor belt of a painting machine is described in the patent EP 1033177 (Venjakob) and comprises a closed scraping band consisting of a small conveyor belt situated with the outer surface of its upper section transversely and in contact with the bottom part of the conveyor to be cleaned which is curved around the end drive roller or over a following auxiliary convex runner, it being envisaged that this secondary belt forms transversely an acute angle with the main conveyor portion with which it makes contact, so as to form a channel for containing the removed paint and it being envisaged that the longitudinal axis of the said secondary belt is not parallel to that of the end drive roller of the conveyor to be cleaned, so that the removed paint can be rapidly conveyed away, without accumulating on said secondary belt as instead occurs in the case of cleaning with a fixed doctor blade. The secondary cleaning belt, owing to the said arrangement at an angle in plan view with respect to the belt to be cleaned, progressively brings into contact with this main belt portions thereof which are always clean and which, after contact, move away from the main belt with a vectorial component which is both longitudinal and transverse, the latter being opposite to the direction of feeding of the said main belt, thus preventing accumulation of the removed paint on the secondary belt.

[0006] This solution has the drawback is that it is unable to achieve vigorous contact between the secondary cleaning belt and the main conveyor to be cleaned since the latter would tend to be deviated by the transverse thrust produced by the cleaning belt. Again as a result of this transverse action, the removed paint is displaced towards one side of the main conveyor, with the risk of contaminating this side and possibly also the inner surface of the said belt of the painting machine, unless solutions are adopted to avoid this problem.

[0007] The invention proposes a device which combines the solutions of the known devices considered above such that it offers the advantages of these devices but not their defects. The device according to the invention, as described in Claim 1 and the following depending claims, is essentially characterized by the use of a reverse roller making contact with the lower section of the main conveyor to be cleaned and by the use of a secondary conveyor belt, as per the second solution mentioned above, for cleaning the said reverse roller.

[0008] Further characteristic features of the invention and the advantages arising therefrom will emerge more clearly from the following description of a preferred embodiment thereof, illustrated purely by way of a non-limiting example in the figures of the accompanying sets of drawings in which:

- Fig. 1 shows a side elevation view of the device with parts cross-sectioned;
- Fig. 2 shows a top plan view of the device according

to Figure 1;

- Fig. 3 shows further details of that end of the device which is provided with the means for transmission of the movement to the secondary belt for cleaning the reverse roller.

[0009] In a Figure 1, T denotes the conveyor of the painting machine and R denotes the end drive roller of this conveyor underneath which the reverse roller 1 operates in a parallel arrangement making contact with the said conveyor, said reverse roller being made of chrome-plated steel and rotating in the same direction F of rotation as the drive roller R, so as to operate on the lower section of the conveyor T with an action opposing the feeding movement of this section, so as to perform vigorous recovery of the paint and cleaning of the said conveyor by means of a vigorous action. It is understood that the scope of the invention also includes the solution where the reverse roller 1 operates in contact with a portion of the lower section of the conveyor T situated downstream of the end drive roller R and retained so that there is a suitable degree of interference with the same cleaning roller 1 by auxiliary drive means.

[0010] The upper section of a cleaning conveyor belt 2 operates by means of tangential contact with the generatrix of a bottom zone of the reverse roller 1, said cleaning conveyor belt being made of a suitable composite, flexible, material, for example such as that used for the main belt T, and being positioned with its longitudinal axis in the direction of the length of the roller 1 and having a length suitably greater than that of this roller 1. The conveyor 2 is supported by a strong longitudinal inner frame 3 which is fixed in any suitable manner to the parallel side walls 104 of the main frame 4 of the device which also rotatably supports the end spindles of the reverse roller 1 actuated by a gear motor unit 5 (Fig. 2) which is flanged with one of the said side walls 104 which are interconnected by at least one further cross-member 204, as can be seen in Figure 1. In Figure 2, 102 and 202 denote the drive rollers of the conveyor 2, the first of which rollers is driven idle and supported by a pair of tensioning plates fixed to the said frame 3, while the other roller 202 is motor-driven, is supported without adjustment by the said frame 3 and/or by a side support 30 (see below) fixed to the adjacent side wall 104 and is actuated by means which, for example, derive the rotational movement from the said gear motor 5 for rotation of the reverse roller 1, as will be described more fully below.

[0011] The upper section of the cleaning conveyor 2 travels in the direction indicated by the arrow F1 shown in Figure 2, namely in the direction of the motor-driven roller 202. From this figure it can be seen how the longitudinal axis of the cleaning conveyor 2 is inclined with respect to the axis of the reverse roller 1 so as to form an acute angle diverging towards the said motor-driven roller 202. The amount of this inclination depends on the width of the belt 2 since the upper section of this belt

touches one end of the roller 1 with a portion close to its opposite side and touches the other end of the said reverse roller 1 with a portion close to its other side. As a result of this longitudinal inclination, the paint which the belt 2 detaches from the reverse roller 1 is gradually conveyed away from this roller 1, also with a component transverse to the direction of travel F1 of this belt, such that this paint covers the belt 2 in a gradual and uniform manner, substantially over its entire width, avoiding accumulation which instead occurs with the static scraping systems and ensuring rapid removal of the said paint, even though relatively dense.

[0012] From Figure 1 it is clear that the cleaning belt 2 is also characterized by an inclined position of its upper section with respect to the horizontal plane, since this section forms with the ideal vertical plane which passes through the contact zone between belt 2 and reverse roller 1 an angle of less than 90°. This transverse inclination has the effect that the paint removed by the belt 2 remains owing to the effect of gravity on the said belt and allows, where necessary, the introduction, via specific supply means 6, of a small continuous quantity of solvent into the contact zone between belt 2 and roller 1, in order to facilitate removal of the paint by the said belt 2. The upper section of the belt 2 travels over a sufficiently flexible surface 7 which is made of metal and/or other suitable material and which interacts with the said belt over the entire length of the upper roller 1 and which projects from the ends of this roller with sections of suitable length, where the said surface 7 has transverse gutter channels 107 and the same surface 7 projects by a suitable amount laterally from the bottom side of the conveyor 2 and terminates with the said channels 107 above a collection tank 8 which is fixed to the frame via the side walls 104 and the bottom wall of which has an inclination for example in the form of a double surface sloping downwards, with a discharge outlet 108 at the lowest point, for evacuating the liquid which drips from above (see below) into a collection tank 9 provided with recirculation pumps (not shown) and positioned in any suitable manner underneath the device in question. The part which remains attached to the upper section of the conveyor 2 passes beyond the drive roller 202 where an anti-spray casing 10 is provided and on the lower return section of the said conveyor 2 the said paint is detached for example by means of at least one transverse and inclined doctor blade 11, with an active part made of an elastomer, a suitable plastic or spring steel. The paint detached by the doctor blade 11 falls into a hopper 12 into which the bottom edge of the said casing 10 drains and from this hopper the said paint is discharged into a container or into other suitable collection and removal means, not shown.

[0013] In order to prevent the upper section of the conveyor 2 from being deviated by the thrust exerted transversely thereon by the reverse roller 1, the said belt 2 is provided internally, on the higher side, with a raised bead 302, for example with a trapezoidal cross-section, which is solid and continuous or formed by a succession of

teeth, as in drive belts, said bead sliding guided inside corresponding annular grooves of the drive rollers 102 and 202 and at least along the upper section of the said conveyor 2 sliding inside a guide groove of suitable cross-section 207 formed longitudinally in the highest part of the portion with which the laminated surface 7 is fixed to the frame 3 supporting the conveyor 2.

[0014] Still with reference to Figure 1, it can be seen that, in order to ensure uniformly distributed contact between the upper section of the flexible cleaning belt 2 and the reverse roller 1, the belt portion 2 which must make contact with the generatrix of the said roller 1 is pushed against this roller by a corresponding portion of the flexible laminated surface 7 which is acted on underneath by a pressing device formed for example by a flexible tube 13 inflated with pressurised fluid, for example with air at suitable pressure values, and this tube is arranged inside a channel 14 fixed onto the frame 3 and situated underneath the surface 7. It is understood that the scope of the invention also includes the constructional variants where the sliding surface 7 may be perfectly rigid and flat or which envisage the use of means other than the inflatable tube 13, for example a rigid and/or spring-loaded pressing device, using solutions known for example in the sector of devices for cleaning the rollers of rotary printing machines.

[0015] Purely by way of a non-limiting example of the scope of protection of the invention, from the figures it can be seen that, parallel to and downstream of the reverse roller 1, there may be provided a second roller 100 for cleaning the lower section of the main conveyor T, which has a length slightly greater than that of the said roller 1, is for example chrome-plated or lined with a fabric or cloth with suitable characteristics, also rotates in the direction F of the reverse roller 1 and is situated at a very small distance and/or so as to make substantially light contact with the latter, so that in the zone of mutual contact the two rollers are in any case able to move in opposite directions, without a negative reaction. This solution of using several reverse rollers arranged alongside each other and in succession is for example of the type described in document No. EP 1136399 in the name of the same applicant and in subsequent improvement patents. The roller 100 is also rotatably supported at the ends by the said side walls 104 and the ends of the two rollers 1 and 100 may, for example, be provided with closing shoulders 16 which operate in substantial contact with the ends of the said two rollers and with the lower section of the conveyor T, so as to define a tank which has limited contact with the external environment and is situated very close to the main conveyor T and into which solvent is continuously introduced by at least one supply pipe 17. Part of this solvent falls downwards through the free space existing between the rollers 1 and 100 and is collected by the surface 7 which conveys it by means of gravity into the collection tank 8. Part of the same solvent introduced by the pipe 17 is conveyed upwards by the rising surface of the reverse roller 1, in order to facilitate

the removal of paint performed by this roller and in order to soften the residual paint which remains on the main conveyor T, so that it may then be more easily removed by the finishing roller 100 which, as mentioned, also operates with an action of the reverse type. Another part of said solvent supplied by the pipe 17 follows the surface of the roller 100 and facilitates the finishing action of this component. Part of the solvent transported by the roller 100 remains inevitably on the main conveyor T in order to soften any residual paint and is removed by a doctor blade 18 which with its ends is mounted on the side walls 104 with the arrangement, in between, of known adjustment means which allow adjustment of the degree of interference between doctor blade and belt, also in order to compensate for gradual wear of the said doctor blade.

[0016] From the figures it can be seen that, for removable fastening to the painting machine, the side walls 104 of the frame 4 for supporting the device in question may for example be provided externally, on the end side for entry into the said painting machine, with lateral grooved pins which have a groove 19 and corresponding roller wheels 20 at a lower level (Figs. 1, 3). The painting machine may be provided, for example, on its side walls (Fig. 2) with horizontal guides 21 with a C-shaped profile which are directed with the hollow part towards each other and which with the outermost end carry, projecting on their inner side, composite wheels 22, for example of the radial-axis type, which travel inside corresponding guides 121 with a C-shaped profile, identical to the guides 21, and which in turn on their end inside the painting machine carry composite wheels 122 which are also of the radial-axis type and travel inside the said guides 21. The guides 121 are interconnected by at least one cross-member 23 which is fixed via special diagonal end plates 123 to the inner sides of the said guides 121, and the ends of this cross-member 23 have, transversely fixed thereto, supports 24 which are provided with an upper groove 124 for centred engagement the said grooved pins 19 and provided with vertical flat tracks 224 on which the said wheels 20 slide and rest. Special adjustment means may be provided on the wheels 20 and/or on the said pins 19, for example in the form of cam-type supports for the said components, in order to ensure precise operating conditions of the device, also in the case where the said device and the means which constrain it in a movable manner to the painting machine have not been constructed in an absolutely precise manner. The side of the frame 3 which is directed outwards is provided, for example, with handles 25 which may be used by the operator to extract the device from the painting machine, for any verification and maintenance purposes and so as to allow subsequent reinsertion of the device in the operating position, locking means (not shown) which can be released if necessary being provided for this purpose in order to keep the device correctly in the operating position or allow extraction thereof.

[0017] As mentioned above, it is possible to envisage specific means for simplifying driving of all the compo-

nents of the device, the driving power being derived for example from a gear motor 5. Purely by way of a non-limiting example, for the aforementioned purpose it is possible to envisage the use of a drive 26 for example of the toothed pulley and belt type (Fig. 2) for transmitting the rotational movement from the reverse roller 1 to the roller 100, while on the side of the device the rotational movement may be obtained from the roller 100 via an angular drive 27 and then a transmission 28 with parallel axes perpendicular to the rollers 1, 100 from where there extends a transmission with shaft and Cardan joints 29 also mounted on a support 30 which may for example help rotatably support the driving pulley 202 of the cleaning belt 2.

[0018] It is understood that the description refers to a preferred embodiment of the invention, with omission of the details relating to the electrical system for powering the gear motor 5 and the various safety systems of the device, since they may be easily deduced and realized by persons skilled in the art.

Claims

1. Device for cleaning from a conveyor belt (T), driven on rollers, fluid substances sprayed thereon, in particular for machines for spraying paint or other products, of the type which comprises a steel cylinder or roller with a smooth surface (1), which operates on the return section of the conveyor (T) with a parallel arrangement for example facing the end drive roller (R) of the said conveyor and which rotates in a direction opposite to the direction of feeding of the return section of the said conveyor, so as to perform effective shaving-off of the residual paint which is detached by scraping means from this reverse roller and collected inside a recovery tank, **characterised in that** these scraping means act on the generatrix of a bottom zone of the said reverse roller (1) and consist of corresponding longitudinal portion of the upper section of a cleaning conveyor belt (2) made of suitable composite flexible material, for example similar to that used for the said main conveyor (T), and situated with its longitudinal axis in the direction of the length of the reverse roller (1).
2. Device according to Claim 1, in which the said cleaning conveyor belt (2) has a length suitably greater than that of the said reverse roller (1) so as to project from the latter with suitable end portions and the said cleaning belt (2) is inclined transversely with respect to the horizontal plane, so as to form with the reverse roller (1) a suitable collection tank which is open at the ends, and is also inclined with respect to the axis of the said reverse roller (1) such that most of the width of the upper section of the cleaning belt is involved in co-operation with the reverse roller (1), the said cleaning belt (2) being continuously operated by means such that its upper section travels in the direction (F1) along which the longitudinal axis of this belt (2) gradually diverges from the axis of the reverse roller so that the paint removed from the reverse roller is rapidly conveyed away from this roller.
3. Device according to one or more of the preceding claims, **characterized in that** it also comprises:
 - means for cleaning the return section of the said cleaning belt (2);
 - means for preventing transverse movements of this cleaning belt (2);
 - means for collecting and channelling the paint from the reverse roller and from the said cleaning belt (2) towards recovery means;
 - means for ensuring suitable and uniform contact pressure between the upper section of the said cleaning belt (2) and the reverse roller (1), so as to ensure effective cleaning of this roller.
4. Device according to one or more of the preceding claims, **characterized in that** it comprises, if necessary, at least one nozzle (6) for introducing solvent into the said tank which is open at the ends and formed by the cleaning belt (2) inclined transversely and by the reverse roller (1), in order to facilitate separation of the paint from this roller by the said belt (2).
5. Device according to one or more of the preceding claims, in which the cleaning conveyor belt (2) is supported by a strong longitudinal inner frame (3) fixed to the parallel side walls (104) of the main frame (4) of the device, which also rotatably support the end spindles of the reverse roller (1) and which are interconnected by at least one further cross-member (204), the drive rollers (102, 202) of the said cleaning belt (2) being supported by the ends of the said frame (3) via pairs of plates which are partly fixed and partly adjustable, and it being envisaged that the upper section of the said cleaning belt (2) travels over a surface (7) which is made of metal and/or other suitable material and which interacts with the belt over the entire length of the upper roller (1) and projects from the latter with end sections where this surface has transverse gutter channels (107) and the said surface (7) projects by a suitable amount laterally from the bottom side of the cleaning belt (2) and terminates above a collection tank (8) which is fixed to the main frame (4) of the device and the bottom all of which has an inclination in the form of a surface sloping downwards, with at least one discharge outlet (108) at the lowest point, for evacuating the liquid which drips from above, into a collection tank (9) situated underneath the device in question.
6. Device according to one or more of the preceding claims, **characterized by** preventing the upper sec-

tion of the cleaning belt (2) from being deviated by the thrust exerted transversely thereon by the reverse roller (1), the said belt (2) being provided internally, on the higher side, with at least one raised bead (302) which slides guided inside corresponding angular grooves in the drive rollers (102, 202) of this belt (2) and which, at least along the upper section of this cleaning belt (2) slides inside a guide channel (207) formed longitudinally in the higher part of the portion with which the said surface (7) is fixed to the frame (3) supporting the cleaning conveyor belt (2).

7. Device according to any one or more of the preceding claims, in which a curved anti-spray casing (10) is provided opposite the end drive roller (202) of the cleaning conveyor belt (2) and the lower return section of the said belt (2) is acted on by at least one doctor blade and/or other suitable means (11) which detaches the paint from this belt and causes it to fall into a hopper (12) into which the paint from the bottom edge of the said casing (10) also drips and from this hopper the same paint falls into a container or into other suitable collection and removal means.
8. Device according to any one or more of the preceding claims, **characterized in that**, in order to ensure a uniformly distributed contact between the upper section of the flexible cleaning belt (2) and the reverse roller (1), the portion of the belt (2) which must make contact with the generatrix of the said roller (1) is pushed against this roller by a corresponding portion of the underlying surface (7) which is formed wholly or partly with flexibility characteristics and which has, acting underneath it, a pressing device formed, for example, by flexible tube (13) inflated with pressurised fluid, for example air at suitable pressure values, and this tube is arranged inside a channel (14) fixed onto the said frame (3) supporting the conveyor belt (2) and parallel to the contact zone between the belt (2) and the reverse roller (1).
9. Device according to Claim 8, **characterized in that**, according to a constructional variant, the surface (7) on which the upper section of the cleaning belt (2) slides may be perfectly rigid and flat, at least in the zone where it makes contact with this belt.
10. Device according to Claim 8, in which means other than the said inflatable tube (13), for example a rigid and/or spring-loaded pressing device, may be adopted using solutions known for example in the sector of devices for cleaning the rollers of rotary printing machines.
11. Device according to one or more of the preceding claims, **characterized in that** a second roller (100) for cleaning the lower section of the main conveyor (T) may be provided parallel to and downstream of

the reverse roller (1), with a length slightly greater than that of the said reverse roller (1), which roller is, for example, lined with fabric or cloth with suitable characteristics, also rotates in the direction of the reverse roller (1) and is situated at a very small distance and/or so as to make substantially light contact with the latter such that, in the zone of mutual contact, the two rollers may in any case move in opposite directions, without a negative reaction, this second roller (100) also being rotatably supported at the ends by the side walls (104) of the main frame (4) of the device and the ends of the two adjacent rollers (1, 100) may be provided with closing shoulders (16) which operate in substantial contact with the ends of the said rollers and with the lower section of the main conveyor (T) so as to define a tank which has limited contact with the external environment and is very close to the said main conveyor (T) and into which solvent is introduced continuously by at least one supply pipe (17), said solvent partly falling through the free space existing between the two rollers (1, 100) and partly being collected by the underlying surface (7) which conveys it by means of gravity into the collection tank (8), while another part of the said solvent is transported upwards by the rising surface of the reverse roller (1), in order to facilitate the removal of paint performed by this roller and soften the residual paint which remains on the main belt (T) so that said paint may subsequently be more easily removed by the finishing roller (100), while a further part of the said solvent follows the surface of the second roller (100) and facilitates finishing of this component and partly remains on the main conveyor (T) so as to soften any residual paint which is then definitively removed by a finishing doctor blade (18) which is mounted with its ends on the said side walls (104) via known adjustment means arranged in between.

12. Device according to one or more of the preceding claims, **characterized in that** it comprises means for simplifying driving of all the rotating components, the driving power being derived, for example, from the gear motor (5) which actuates the reverse roller (1), a drive (26) for example of the belt and toothed-pulley type being provided for this purpose for transmitting the rotational movement from the reverse roller (1) to the downstream roller (100), while on the other side of the device the rotational movement is obtained from this second roller (100) by means of an angular drive (27) and then a transmission (28) with axes parallel to each other and perpendicular to the said rollers (1, 100), from where there extends a transmission with shaft and Cardan joints (29) also mounted on the support (30) which may also assist rotational supporting of the drive pulley (202) of the cleaning conveyor belt (2).

13. Device according to one or more of the preceding claims, **characterized in that** it may be mounted on the painting machine and the side walls (104) of the frame (4) may be provided externally, on the entry side into the painting machine, with lateral grooved pins (19) and corresponding roller wheels (20) at a lower level, while the painting machine is provided on its side walls with horizontal guides (21) with a C-shaped profile, which are directed with the hollow part towards each other and which with the outermost end support, projecting on their inner side, composite wheels (22) which travel inside corresponding guides (121) with a C-shaped profile, which are identical to the aforementioned said guides (21) and which in turn carry on their end inside the painting machine composite wheels (122) which travel inside the said guides (21), the said guides (121) being interconnected by at least one cross-member (23) fixed to the inner sides of these guides (121) and the ends of this cross-member (23) having, fixed transversely thereto, supports (24) provided with an upper groove (124) for centred engagement with the said grooved pins (19) and provided with vertical and flat tracks (224) on which the said wheels travel and rest (20).

14. Device according to Claim 13, **characterized in that** it comprises adjustment means for example of the cam type, for allowing precise adjustment of the condition of the said device, for example for adjusting with precision the interference between the reverse roller (1) and the conveyor to be cleaned (T) of the painting machine

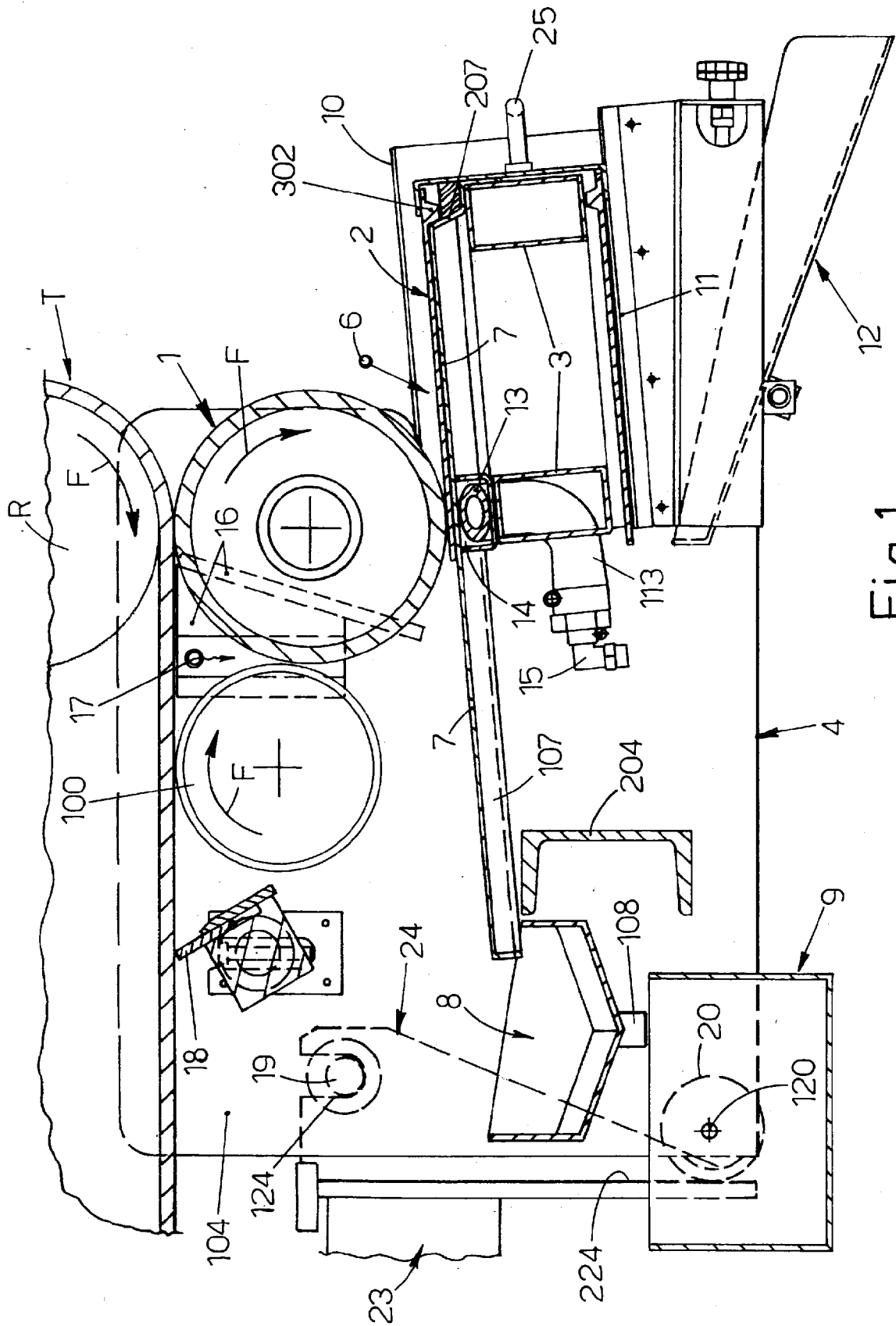
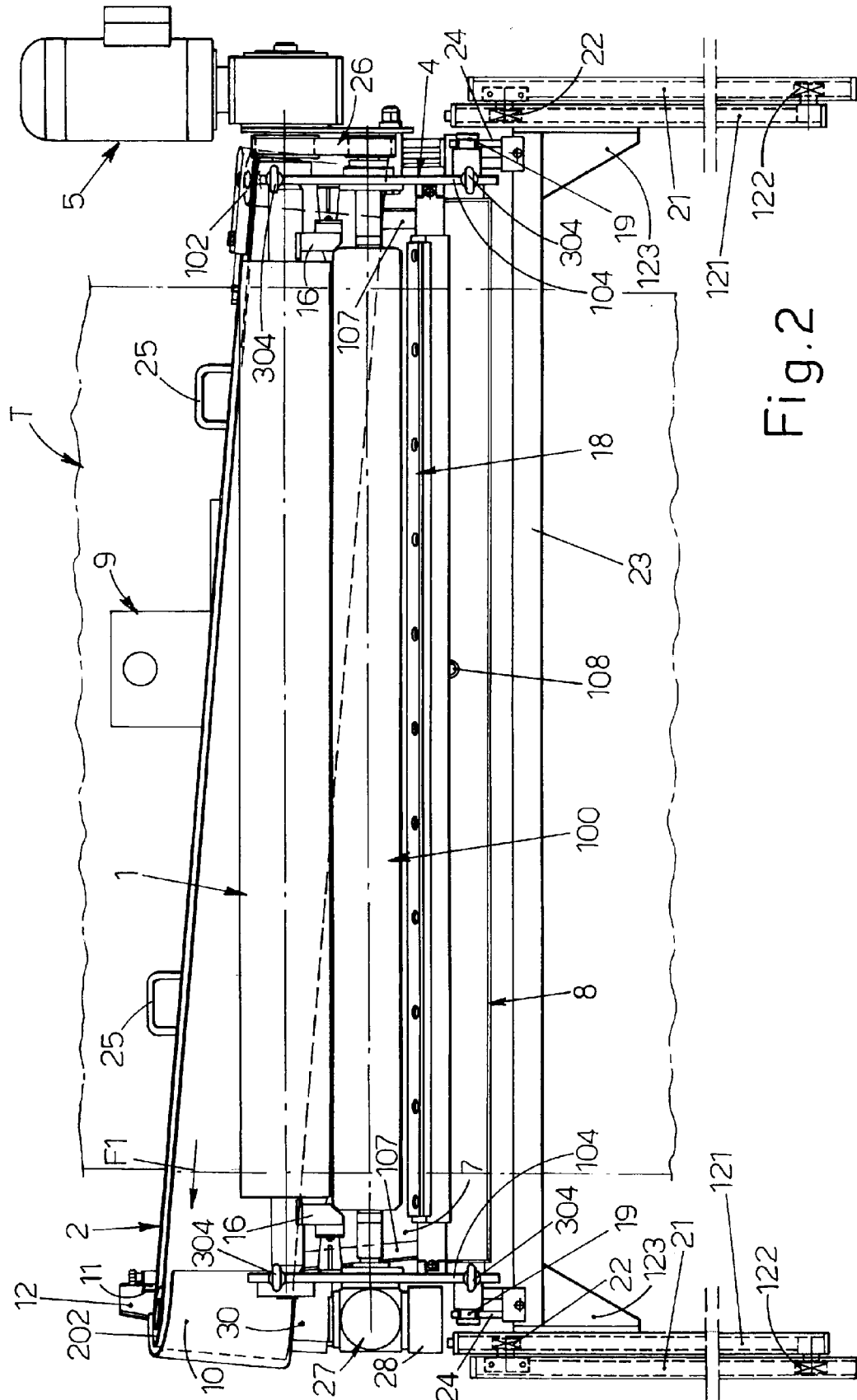


Fig.1



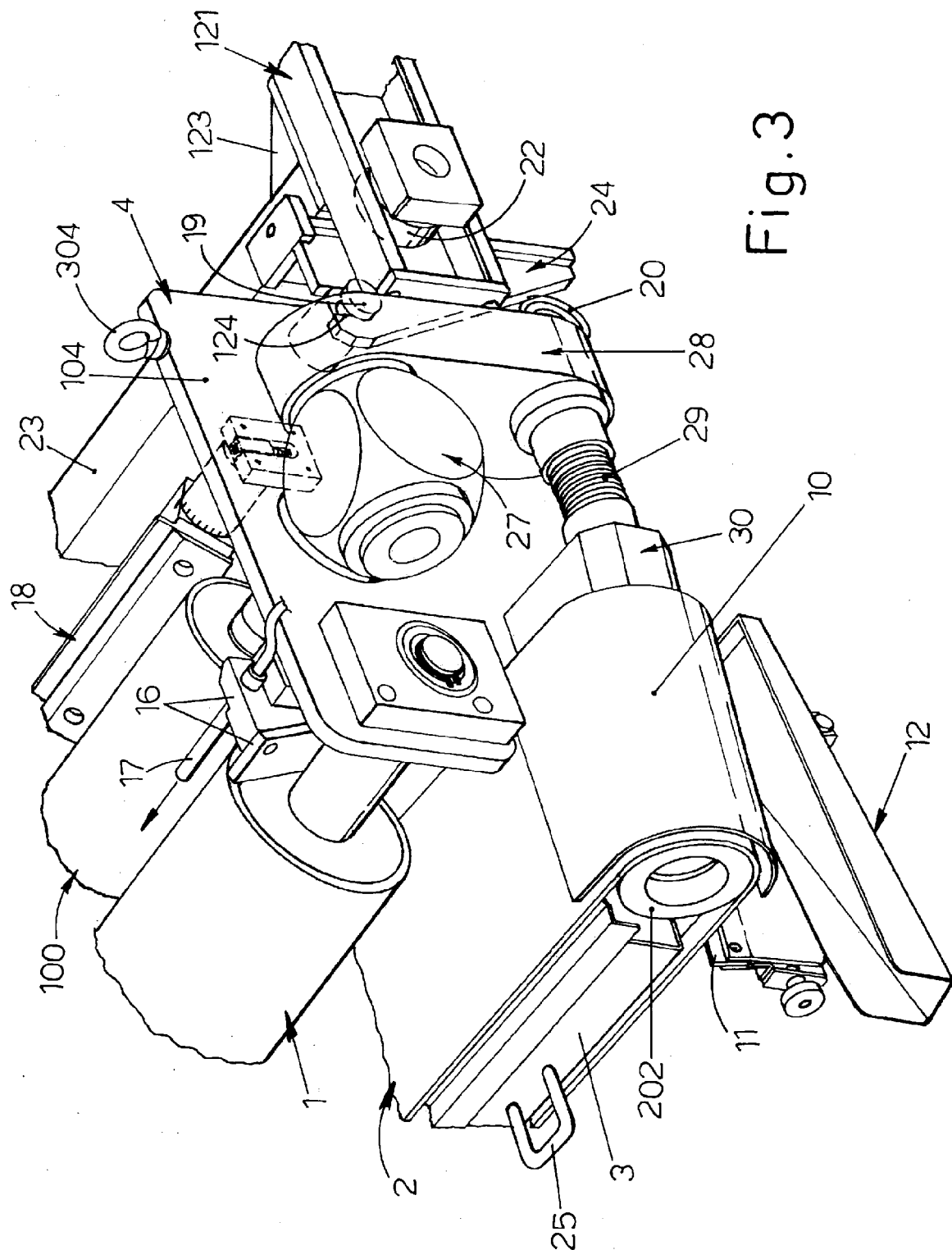


Fig. 3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 08 15 1831

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 28 May 2008	Examiner Roberts, Peter
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

5

EPO FORM 1503 03/02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 08 15 1831

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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